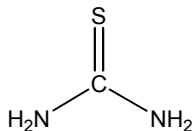


**THIOUREA**  
**CAS No. 62-56-6**

First Listed in the *Third Annual Report on Carcinogens*



## CARCINOGENICITY

Thiourea is *reasonably anticipated to be a human carcinogen* based on sufficient evidence for the carcinogenicity of thiourea in experimental animals (IARC V.7, 1974). When administered in the drinking water, thiourea induced thyroid adenomas and carcinomas in rats of both sexes and squamous cell carcinomas of the Zymbal gland in male rats. When administered in the diet, thiourea induced hepatocellular adenomas in rats and hepatomas in rainbow trout. When injected intraperitoneally and administered in drinking water, thiourea induced squamous cell carcinomas and mixed cell sarcomas in the Zymbal gland of rats of both sexes.

There are no data available to evaluate the carcinogenicity of thiourea in humans (IARC V.7, 1974).

## PROPERTIES

Thiourea occurs as white, lustrous crystals or flaky solids. It is soluble in cold water, ammonium thiocyanate solution, and ethanol and almost insoluble in ether. When heated to decomposition, it emits toxic fumes of nitrogen oxides (NO<sub>x</sub>) and sulfur oxides (SO<sub>x</sub>). Thiourea is available in the United States as a 99% pure reagent grade. It may react violently with acrolein.

## USE

A recent evaluation indicates that thiourea now is used only in animal glue liquefiers and silver tarnish removers, and that these uses are diminishing. Liquid animal hide glues contain 10-20% thiourea as a liquefying agent. Another report indicates commercial use of thiourea in the production of flame-retardant resins and as a vulcanization accelerator. Thiourea (12%) is also used in a metal cleaner. Formerly, the chemical was used in the production of diazo-type coatings for copy paper as an antiyellowing agent; in boiler water treatment to remove copper scale; to prevent the appearance of brown stain of hemlock wood; as a silver toning agent in photographic papers; in the synthesis of pharmaceuticals and insecticides; as a catalyst in the isomerization of maleic acid to fumaric acid; in hair preparations; in chelating agents; in dye intermediates; in dry cleaning chemicals; as an antithyroid agent; as a fungicide; as an accelerator of sprouting in dormant tubers; as a weighting agent for silk; as a dye-bath adjuvant of textiles; as a substitute for urea-formaldehyde resins; as a pickling inhibitor and ingredient in plating baths for metals; in the preparation of nonglare mirrors; in the synthesis of sulfathiazole and thiouracil; for the treatment of nylon to prevent running and improve handling properties; and as a reagent for determination of bismuth and selenite ions (IARC V.7, 1974).

## PRODUCTION

The Chem Sources USA directory identified four domestic producers of thiourea in 1986, and two producers in 1984 (Chem Sources, 1986; Chem Sources, 1984). However, there is no evidence to indicate that the compound has been produced in commercial quantities in the United States in recent years. The United States imported nearly 7 million lb of thiourea, thiourea dioxide, thiocarbamates, and other related rubber processing chemicals in 1987, nearly 9.8 million lb in 1985, and almost 10.9 million lb in 1984 (USDOC Imports, 1988, 1986, 1985). The United States exported about 300,000 lb of thiourea, thiourea dioxide, thiocarbamates, thiurams, and other related chemicals (except pesticides) in 1987, about 500,000 lb in 1985, and fewer than 400,000 lb in 1984 (USDOC Exports, 1987, 1986, 1985). The 1979 TSCA Inventory reported that 3 companies produced 6.6 million lb and 18 companies imported 2.9 million lb in 1977 (TSCA, 1979). It was estimated that more than 3.7 million lb of thiourea were imported in 1973, and more than 2.6 million lb were imported in 1972. Commercial production of thiourea began in the United States in 1938 (IARC V.7, 1974).

## EXPOSURE

The primary routes of potential human exposure to thiourea are inhalation and dermal contact. The greatest risk of potential exposure exists for workers involved in the production of thiourea or in the application of one of its uses. Potential occupational exposure also occurs during the formulation of products made from the compound. The National Occupational Hazard Survey, conducted by NIOSH from 1972 to 1974, estimated that 213,000 workers were potentially exposed to thiourea in the workplace (NIOSH, 1976). The National Occupational Exposure Survey indicated that 21,776 workers, including 7,474 women, potentially were exposed to thiourea (NIOSH, 1984). This estimate was derived from observations of the actual use of the compound (48% of total observations) and the use of tradename products (52%). There is a small risk of consumer exposure to thiourea in silver tarnish removers or in liquid animal glues, which have been widely replaced by woodworking glues. Thiourea has been found to occur naturally in laburnum shrubs, and as a metabolite of *Verticillium albo-atrum* and *Bortrylio cinerea* (IARC V.7, 1974). There is also a potential for exposure to thiourea in ophthalmic solutions which contain it. The Toxic Chemical Release Inventory (EPA) listed 25 industrial facilities that produced, processed, or otherwise used thiourea in 1996 (TRI, 1990). In compliance with the Community Right-to-Know Program, the facilities reported releases of thiourea to the environment which were estimated to total 6801 lb.

## REGULATIONS

EPA regulates thiourea under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Food, Drug, and Cosmetic Act (FD&CA), Resource Conservation and Recovery Act (RCRA), and Superfund Amendments and Reauthorization Act (SARA). Under CERCLA, RCRA, and SARA, EPA regulates releases of the compound. A reportable quantity (RQ) of 10 lb has been established for thiourea under CERCLA. Under FD&CA, EPA regulates thiourea as a toxic inert ingredient in pesticides. EPA has considered establishing reporting requirements for the compound under the Toxic Substances Control Act (TSCA). FDA regulates thiourea as a constituent of over-the-counter drug products, and prohibits its use in human food under FD&CA. OSHA regulates thiourea under Hazard Communication Standard and as a chemical hazard in laboratories. Regulations are summarized in Volume II, Table B-141.